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INSECT CONDITIONS IN INTERMOUNTAIN STATION TERRITORY - 1959

The insect survey program during 1959 was carried out pretty well as planned. A heavy fire season in the Region One part of the Intermountain territory, with attendant heavy smoke conditions interfered to some extent with aerial coverage. It resulted in less flying than planned, but it is believed that no serious insect situations have been missed.

There were certain weather conditions during the year that were common to most of the areas--a wet, cool spring, a dry and hot summer, and fairly heavy September rains. Snow came early in the high country but warm weather in October removed most of it.

As a matter of convenience, the results will be presented by Forest Service regions. Infestations on lands of all ownerships are included. Cooperation by Forest Service, Department of The Interior, State and private personnel contributed to the over-all coverage and to the success of the surveys.

Region One

BARK BEETLES

Mountain pine beetle.--Stands of old-growth western white pine in Region One are chronically infested with mountain pine beetle, Dendroctonus monticolae Hopk. These infestations fluctuate from year to year but the average annual loss ranges from 1 to 5 percent of the stand. White pine stands in parts of the Clearwater were again infested in 1959 by the beetle, and rate of tree mortality is approximately 2-1/2 percent of the white pine trees. Elsewhere in Idaho and western Montana lighter infestations were active in western white pine stands.

Mountain pine beetle activity in lodgepole pine appeared to be at a low level in the region during 1959. One outbreak in Glacier National Park that has been under observation for several years decreased 64 percent during the season.

Kootenai National Forest personnel reported approximately 100 ponderosa pine attacked in partially logged areas. These attacks were widely scattered and were usually in suppressed trees.

Western pine beetle.--Dendroctonus brevicomis Lec. appears to be more active in 1959 than observed during the past few years. Several groups of attacked ponderosa pine were reported, mostly on the Lolo National Forest, Montana. In several instances Ips species were associated with the attack of the pine beetle in small diameter trees.

In the Nezperce National Forest, Idaho, increases in the number of ponderosa pine attacked were noted. Attacked trees are still few in number and widely scattered, but are found more often in small groups instead of singly attacked trees.

Douglas-fir beetle.--Several reports of Dendroctonus pseudotsugae (Hopk.) activity were received during 1959. Logging of infested timber in the Swan River valley was started during the year. Some small areas of bark beetle activity occurred in the region but other than in the Swan River area there were no large outbreaks such as have occurred in past years.

Engelmann spruce beetle.--Dendroctonus engelmanni Hopk. is still active in many of the spruce stands in northern Idaho and western Montana. While there are some indications of decreased beetle activity in most of the previously infested drainages, an outbreak in the Kootenai National Forest increased to an alarming extent in 1959. The infestations that persist are nearly all associated with logging areas and are remnants of the outbreak that originated in 1952.

Secondary bark beetles.--A number of outbreaks of secondary bark beetles, mostly Ips species, were reported during the year. Many of these infestations were those of Ips oregonis (Eichh.) in ponderosa pine. It appears that the activity of secondary insects has increased during the year.

DEFOLIATORS

Spruce budworm.--During 1959 little change was noted in the epidemic of Choristoneura fumiferana (Clem.) that has plagued Douglas-fir forests in central Montana for over 10 years. Most of the available Douglas-fir type east of the Continental Divide is infested to some degree, and much of the acreage sprayed in 1953 and from 1955 through 1957 to control the budworm is again repopulated to varying degrees.

Little budworm-caused tree damage has occurred west of the Continental Divide in mixed stands characterized by the larch - Douglas-fir type. In areas where the budworm has persisted the forest conditions often resemble those found east of the Continental Divide. An exception to this is a longstanding budworm outbreak in the Craig Mountain area of Idaho, south of Lewiston. Here the budworm has persisted in mixed stands of Douglas-fir and grand fir for at least 10 years, and has been characterized by greatly fluctuating budworm populations. A considerable amount of top killing has resulted, but tree mortality has been confined mostly to understory grand fir.

Ground surveys in Montana showed an average of 36 percent needle defoliation in 1959 compared with 48 and 49 percent in the past two years. Following is a summary of budworm conditions in the region:

	Acres
Infested 1947 - 1959	5,888,000
Controlled by aerial spraying	2,169,049
Resprayed during control	163,490
Reduced to endemic level by natural control	276,000
Uncontrolled, 1959	3,442,951

Pine-feeding budworm.--During the past few years several infestations of Choristoneura lambertianae (Busck) have been observed in lodgepole and white-bark pine stands in Montana and in lodgepole pine stands in Yellowstone National Park, Wyoming. These outbreaks are associated with spruce budworm infestations in adjacent or intermixed Douglas-fir stands. In 1959 another infestation of the pine-feeding budworm was noted near Helena, Montana. In this instance the host tree species was ponderosa pine.

Pine butterfly.--Neophasia menapia Feld. appeared more numerous this year in northern Idaho and western Montana. From 6 to 8 butterflies per tree top were counted in ponderosa pine stands in the Nezperce National Forest. Similar conditions were observed around the tops of western white pine trees in the Clearwater National Forest. Continued surveillance is planned.

Larch casebearer.--Coleophora laricella (Hbn.) is now spread over practically all of northern Idaho and northeastern Washington. In 1959 the insect was found in small numbers northwest as far as Colville, Washington, north to Bonners Ferry, Idaho, east to Lookout Pass marking the Idaho-Montana boundary, and south to Bovill, Idaho. The total area included within these limits is 8,000 square miles, or twice the area of infestation that was found last year. In 1958 the total area was erroneously reported as 110 square miles; the figure should have been 4,000 square miles.

In contrast to the over-all rate of spread of the larch casebearer the area of heavy infestation remained about the same in 1959 as it was in 1958. Visible defoliation extends over 15,000 to 20,000 acres in the vicinity of St. Maries, Idaho.

The extent of natural control by parasites is insignificant. Over 5,000 larch casebearer pupae were collected throughout the heavily infested area and reared to determine the amount of parasitism. Less than 1 percent of the population collected was parasitized; the only parasite recovered was Spilochalcis albifrons. As in 1958, the parasite population consisted entirely of males. It is believed that the larch casebearer is too small a host to provide for the greater nutritional requirements of S. albifrons females. Thus it is doubtful if this species of parasite can build up sufficient numbers to be important in exerting natural control.

Sawflies.--Several species of sawflies show an upward trend in the region. At least 6 different species have been collected from various host trees including Douglas-fir, ponderosa pine, limber pine, lodgepole pine, and larch. Most of these species are unidentified as yet, and it is believed that several undescribed specimens are included in the collection.

An outbreak of sawfly, Neodiprion sp., in lodgepole and ponderosa pine in and adjacent to the Lewis and Clark National Forest, Montana, severely defoliated approximately 7,000 acres of overstory trees. An evaluation of this outbreak indicates the possibility of a downward trend.

Pristiphora erichsonii (Hartig) was detected in 1958 near Missoula, Montana for the first time since 1944. Several large patches of western larch in Blackfoot River drainage have been defoliated but no tree mortality has resulted.

In 1958 two new species of Pristiphora were reared from western larch near Sandpoint, Idaho. A major difference in these insects is that pupation takes place on the foliage in contrast to P. erichsonii which pupates in the duff.

Alder flea beetle.--Widespread defoliation of alder and willow through northern Idaho and northwestern Montana was caused by the alder flea beetle, Altica ambiens (Lec.). The foliage on thousands of acres of streamside cover was skeletonized.

TWIG AND TERMINAL SHOOT INSECTS

Pine tip moth.--Infestations of Rhyacionia sp. have persisted for many years in the Long Pine and Sioux Divisions of the Custer National Forest. Severe damage is concentrated in dense patches of ponderosa pine (Pinus ponderosa var. scopulorum Engelm.) reproduction; the affected trees are deformed and stunted from successive years of damage to the terminals by pine tip moth larvae.

Engelmann spruce weevil.--Stunted Engelmann spruce trees in the Kishenehn Creek drainage, Glacier National Park, Montana were found infested with spruce weevil, Pissodes engelmanni Hopk.

Pine resin midge.--Retinodiplosis sp. was active in many parts of the region in 1959. Large plantations covering several thousand acres in the Kaniksu National Forest, Idaho, suffered considerable damage to lateral branch tips. Some tree mortality from a combination of midge damage and other factors was observed.

SUCKING INSECTS

The pine needle scale.--Infestations of Phenacaspis pinifoliae (Fitch) were again abundant in the western part of Region One this season. The scale was reported feeding on ornamental blue spruce and lodgepole pine trees.

Spruce gall aphid.--The spruce gall aphid, Chermes cooleyi Gill., persists on ornamental spruce trees, Engelmann spruce, and Douglas-fir trees all over Region One. Christmas tree farmers raising Douglas-fir trees near Rexford, Montana have complained of the yellowing of needles by the feeding of aphids.

A fir aphid.--An Aphid, Cinara sp. has been unusually abundant throughout grand fir stands in northern Idaho and the Kootenai National Forest, Montana.

Aphid on alpine fir.--An unknown species of aphid was detected on terminal twigs of alpine fir in many areas of northern Montana and Idaho. The degree of damage caused by this aphid has not been determined.

A woolly aphid.--An aphid covered with waxy wool was reported to be abundant on alpine fir in ornamental plantings east of the Divide and on firs in the Gallatin National Forest. A similar aphid was detected on Lolo Peak south of Missoula, Montana. Economic importance is undetermined.

Spruce spider mite.--Spruce spider mite, Oligonychus ununguis (Jacobi), populations were observed during 1959 at scattered locations on the Deerlodge, Lewis and Clark, Helena, and Gallatin National Forests, and in Yellowstone National Park. These mite populations probably were remnants of fairly heavy spider mite populations that occurred in these areas in 1957 and 1958.

Although mite populations were at a low level, damage caused by heavy mite populations in 1957 and 1958 was still visible on most Montana Douglas-fir forests east of the Continental Divide. Damage was restricted to those forest areas sprayed with DDT for spruce budworm control in 1956 and 1957.

Region Four

BARK BEETLES

Mountain pine beetle.--Lodgepole pine stands scattered throughout the range of the type in U. S. Forest Service Region Four are suffering considerable damage from epidemic infestations of mountain pine beetle, Dendroctonus monticolae Hopk. Lodgepole pine occurs throughout the northern half of the region which includes northern Utah, western Wyoming, and southern Idaho.

Of 22 epidemic centers, 8 were included in 1959 chemical control projects and 6 of these have been treated for 2 or more years. Of 12 new centers discovered this year, 6 are isolated spots some distance from the nearest

known infestations while the remainder occur relatively close to previously known outbreak areas. In all but 3 of the epidemic centers the beetle shows an upward trend.

In Idaho the mountain pine beetle infestations occur on the Sawtooth and Targhee National Forests and on State and private lands near Kilgore. In Wyoming epidemic populations are found on the Teton National Forest and in Grand Teton National Park. The extensive outbreak on the Wasatch National Forest continues as does a small but threatening infestation on the Ashley National Forest in Utah.

While control efforts have been successful in reducing populations in treated areas, the appearance of new centers of infestation and expansion of older centers indicates the serious nature of the present mountain pine beetle problem in the lodgepole forests in Region Four.

An epidemic of mountain pine beetle in second-growth ponderosa pine has been present in the Crystal Bay area at the north end of Lake Tahoe in Nevada since 1949. The epidemic continues to increase and during 1957 probably more trees were attacked than had been killed during the preceding 8 years. A cooperative private, State, and Federal control program was undertaken in 1958 and more than 6,000 trees were logged or burned. No control was carried on in 1959 and surveys revealed that the populations built up to a point where there are now approximately 8,000 infested trees.

Another infestation of mountain pine beetle in second-growth ponderosa pine was discovered in and around Atlanta, Idaho on the Boise National Forest during surveys in 1958. During the spring of 1959, 1,397 infested trees were cut, decked, and burned. A survey this fall revealed that there are possibly 500 to 800 infested trees present in the area.

Black Hills beetle.--Infestations of Dendroctonus ponderosae Hopk. on the Dixie National Forest and Bryce Canyon National Park in southern Utah have been significantly reduced by direct control. During 1958 it was reported that a downward trend was observed and it continued in 1959. Severe drought conditions were experienced this year and in spite of the downward trend it it felt that without continued control effort remaining infestations, estimated at 2,200 trees in ten units on the Forest and 200 trees in the Park, could reverse this trend if severe drought conditions persist.

Engelmann spruce beetle.--Dendroctonus engelmanni Hopk. is recognized as one of the most destructive pests of Engelmann spruce in U. S. Forest Service Region Four. History shows that in this region many destructive outbreaks have occurred in the past. In the past few years several serious outbreaks have developed and considerable effort has been expended through logging and chemical treatment to reduce the losses and prevent expansion of the infested areas. Accomplishments to date have been noteworthy in that attack against the outbreaks by logging and direct control have reduced the beetle population in treated areas and held losses to a minimum.

An outbreak on the Bridger National Forest is the oldest of the most recent spruce beetle outbreaks in the region. Since 1955, logging, chemical treating, and felling of trap trees have been employed to contain a serious epidemic of Engelmann spruce beetle in the vicinity of Gypsum Creek on the Bridger. For the most part, these practices have effectively contained the infestation with the exception of flights that reinfested the area in and around Moose Creek on the north side of Little Sheep Mountain in 1958 and 1959. The north slopes of Little Sheep Mountain are currently being logged and treated. Woodpeckers appear to have migrated from the old infested area and are helping to reduce brood population. Throughout the infested area a decided increase of parasites of the genus Coeloides was noted. In spite of an increase in parasite action and woodpecker populations, it does not seem likely that the existing natural control factors can cause sufficient brood mortality to reverse the infestation trend. Additional control will be necessary to prevent flareups in this epidemic.

In June of 1958 an outbreak was detected in the high country of the Uinta National Forest where it joins the Ashley and Wasatch National Forests. An immediate program of logging and treating was started and continued in 1959 as soon as the snow melt permitted access to the area. Examination through the summer and fall of 1959 showed that the beetle population had been drastically reduced and consequently fewer trees were attacked in 1959. Brood samples showed less brood density per square foot of sample than was recorded in the fall of 1958. Nevertheless, the population still remains at epidemic levels and it can be expected that an increased number of trees may be attacked during the next year's flight period unless remaining material is logged or treated.

During the year the Targhee National Forest reported an area of spruce beetle activity near Henrys Lake in Idaho. Examination of the area revealed an infestation covering about 100 acres. Trees were examined that showed infestation in 1957 and 1958 which were heavily woodpeckered with the bark removed from an average of 80 percent of the infested bole in a majority of the trees. The limited amounts of spruce remaining in the area, plus the action of natural control factors resulted in a conclusion that there is no going spruce beetle epidemic and existing populations will be greatly reduced by natural factors.

Aerial detection surveys during the fall of 1959 revealed two areas of suspected Engelmann spruce beetle activity on the Teton National Forest. Subsequent ground evaluations revealed that only an endemic population existed. Continued surveillance is indicated.

After 2 years of logging and chemical treatment, Engelmann spruce beetle populations have been greatly reduced in Dark and Unknown Canyons on the eastern side of Mt. Peale on the Manti-LaSal National Forest, Utah. Control operations to date have effectively prevented any extensive spread in the surrounding overmature spruce stands. Biological evaluations, however, show heavy one- and two-year generation strains in untreated slash and standing trees. The present populations have the potential for causing considerable numbers of new attacks and further control efforts are indicated.

A small Engelmann spruce beetle infestation covering approximately 700 acres in the Griffin Springs area of the Aquarius Plateau on the Dixie National Forest is continuing at a moderately high level. These stands have a long history of spruce beetle activity. The current infestation is a result of populations emerging from logging slash after cutting had ceased in the area in 1957. Logging and chemical control measures were carried on in 1958 but no control was undertaken in 1959. Examination this year revealed moderately high residual populations and indications are that this population will probably continue to increase unless additional control work is undertaken.

During 1958 four new outbreaks were discovered in rather widespread locations. They were the infestation on the Wasatch, Ashley, and Uinta National Forests; the Mt. Peale infestation near Moab, Utah; Fisher Creek on the Payette National Forest; and the Aquarius Plateau area on the Dixie National Forest. Altogether, they involved over 80,000 infested trees with each area considered highly epidemic. Present conditions show that although epidemic tendencies remain, the number of infested trees was greatly reduced by vigorous and efficient control programs carried on by the land managers. It does not appear that biotic factors were responsible for any significant brood reductions, and climate did not adversely effect brood populations last winter. There are some factors, however, that could influence future trends of the infestation in all but one new infestation on the Ashley National Forest and the Gypsum Creek infestation on the Bridger National Forest. The brood densities are somewhat lighter than were recorded last year. Over-all it is expected that at least some buildup will take place in every area if broods are not further reduced through control and logging.

Douglas-fir beetle.--Reports during 1958 indicated an upward trend in populations of Dendroctonus pseudotsugae (Hopk.) throughout Region Four. In 1959 the increasing trend was particularly evident in southern Idaho stands of Douglas-fir. In western Wyoming the upward trend was less noticeable. The outbreak on the Dixie National Forest in southern Utah continued at a high level.

DEFOLIATORS

Spruce budworm.--In southern Idaho from 1952 to 1957 infestations of Choristoneura fumiferana (Clem.), increased both areawise and in intensity and during this period 2,029,747 acres of Douglas-fir and true firs were aerially sprayed to control this insect. In 1958 damage levels increased in severity only in limited areas. No control project was recommended in 1958 because most of the budworm infestations then unsprayed were relatively new, tree killing was not expected, and the significance of existing spider mite infestations had to be determined.

Budworm infestations during 1959 in southern Idaho have either decreased or remained static in size and intensity. A few small areas are exceptions and showed an increasing trend, particularly on the Targhee National Forest.

Acreage infested in 1959 totals 499,000 acres and occurs on the Payette, Salmon, Sawtooth, and Targhee National Forests. Of this total only 59,000 acres were classified as heavy infestation.

Aerial detection surveys in 1959 on the Salmon National Forest revealed a change in the pattern of infestation. For the first time in 5 years defoliation occurred in smaller broken areas rather than in large continuous blocks. No new areas were discovered and this pattern is occurring within the older infestation. Ground examinations revealed a decrease in intensity of defoliation. In 1958, 100,000 of the 478,000 acres infested showed more than 75 percent defoliation. In 1959 only 10,000 of the 165,000 acres were judged to be that severe. A biological evaluation indicates that in 1960 defoliation may be less serious than was experienced in 1959.

Infestations on the Sawtooth National Forest have been in progress since about 1949, with rather strong fluctuations in population density from year to year. In 1957 a substantial increase in size occurred, followed in 1958 by a definite decrease in damage and insect population. Observations in 1959 indicate that there may be an increase in defoliation in 1960.

Infestations of spruce budworm on the Targhee National Forest were first observed in 1956 and were sprayed in 1957. Some reinfestation occurred and some new areas became infested with considerable variation in intensity of defoliation. Only 4,000 of the 204,000 acres currently infested suffered greater than 90 percent defoliation in 1959. The average defoliation for 1959, within the forest, averaged 53 percent. There is one encouraging factor for only within the Targhee infestation does the parasite-predator complex appear to be increasing significantly.

The Payette National Forest has had considerable infestation during the past few years. This year only 5,000 acres within Profile Creek were infested. Defoliation ranged between 75 and 90 percent. Severe frost damage to the new growth occurred on the majority of Douglas-fir in this drainage. Consequently only alpine fir was defoliated. It is expected that the population in 1960 may be fairly heavy.

The general budworm picture in southern Idaho in 1959 would seem to be relatively stable at a population damage level that is less serious than it has been during the past few years. There are a few exceptions where high populations exist that could cause loss of timber if high populations persist but this is not expected in 1960 due to the general tree vigor and predicted general decline or leveling off of the larval population. In each of these exceptional cases only a minor portion of the total acreage is involved.

Lodgepole needle miner.--Recurvaria milleri Busck. is an important insect pest of the lodgepole pine forests of the Intermountain Region. The first report of this insect on record for this region concerns an infestation on the Cassia Division of the Minidoka (now Sawtooth) National Forest in 1938 which subsided around 1943. The next report of the needle miner was in 1949 when an infestation built up over most of the lodgepole stands on the Sawtooth, Targhee, and Caribou National Forests. This outbreak died out in 1953.

The present infestations were detected in the fall of 1958. The main infestations are on the Cassia Division of the Sawtooth National Forest and near Warm River in the Big Falls of Henrys Fork and the Snake River on the Targhee National Forest. Additional surveys showed a number of smaller infestations on the Bridger, Caribou, and Targhee National Forests.

The lodgepole needle miner has a two-year life cycle, the moths flying in odd numbered years in this region. This year the insect was in its second year of development.

The lodgepole needle miner outbreak has increased in area and intensity now covering about 104,600 acres. Evaluations indicate that in all probability this insect's activity will continue to increase for the next few years.

Pandora moth.--In mid-June of 1959 large greenish-brown larvae were sent to the Division of Insect Research by members of a Station timber survey crew. Their verbal report stated that numerous caterpillars were feeding on lodgepole pine stands along the north slopes of the Uinta Mountains on the Ashley National Forest. These caterpillars were identified as larvae of the pandora moth, Coloradia pandora Blake.

An inspection of the area revealed the infestation covered approximately 15,000 acres extending along both sides of the main road from the Summit Springs Ranger Station through Hickerson Park.

During the biological evaluation of this infestation it was revealed that there was a heavy population of mature caterpillars. The larvae appeared to feed more or less en masse with large numbers stripping one tree and then migrating to another. It was noted that some caterpillars had the symptoms of a wilt disorder. To get a better picture of the damage and to assess the overwintering population, a second examination was made early in September. About 300 acres were considered to be severely defoliated and in this area about 1 percent of the trees were completely stripped of foliage with the remainder of the trees defoliated to a lesser extent. During efforts to sample the overwintering pupae in the ground the distribution was found to be far from uniform. Only rarely were pupae found beneath the crown of lodgepole pine, instead they were found in the sunny openings within the stand where grass and other low-growing vegetation was present or wherever the soil and duff had been disturbed such as

around uprooted trees, road cuts, and animal burrows. Of the pupae collected during this examination about 4 percent was putrified, possibly due to the presence of a pathogen. No evidence of predation by small mammals was noted.

Since the pandora moth has a two-year cycle and during the year 1960 will overwinter as young larvae, there will probably be a very limited amount of defoliation during 1960. It will be possible to determine more closely the probability of heavy feeding during the following year and if necessary consider control possibilities.

Aspen leaf miner.--Phyllocnistis populiella Chamb. has been a serious defoliator of aspen within western Wyoming and southeastern Idaho for the past 10 to 12 years. This infestation covers nearly all of the aspen on the Bridger, Teton, Targhee, and Caribou National Forests and Grand Teton National Park. As a result of repeated defoliation by the mining larvae, tree mortality has occurred in patches. A majority of the infested aspen produces only stunted foliage and shows signs that tree mortality may continue during succeeding years.

Tussock moths.--Several outbreaks of tussock moth have occurred in Region 4 during the past 5 years. It appears that more than one species is involved but determinations have not been received from specialists. A Douglas-fir tussock moth outbreak began in 1956 in Owyhee County, Idaho and increased sharply in 1957 but was virtually eliminated in 1958, primarily as a result of a virus disease. Only one small drainage remained infested at a low population level in 1959.

An infestation of tussock moth on bitterbrush was first reported in June, 1958 near Carson City, Nevada and has since been under observation. Part of the area has been used for experimental tests with virus material obtained from Douglas-fir tussock moth in Idaho. These tests proved that this virus could be established at an application rate of 10,000,000 polyhedra per acre, and good mortality could be obtained the first year at the rate of 50,000,000 polyhedra per acre when applied in a water suspension with corn syrup as a sticker. A virus that may be native was found within a population of tussock moth on bitterbrush in an area that was separated from the test areas.

Bitterbrush has suffered some twig killing but during the past two years has managed to put on two crops of leaves annually and no appreciable mortality is expected.

Approximately 5,000 to 10,000 acres of ceanothus, willow, bitterbrush, ninebark, ribes, and rosebrush were infested by a tussock moth during the summer of 1959 at Idaho City, Idaho. The occurrence of a virus disease during this first year of noticeable infestation was unusual and practically eliminated the entire infestation. No egg masses were found during the fall evaluation and all brush species, except willow, were refoliating.

An unusual situation was noted this year by Dr. Mielke, forest pathologist. In July, on the Targhee National Forest in Idaho a tussock moth was found feeding on dwarf mistletoe on lodgepole pine. The infestation was located near the Buffalo Ranger Station not far from Island Park Reservoir. When entomologists examined the infestation in July larvae were pupating. There was no evidence of feeding on lodgepole foliage. Dr. Mielke stated that the feeding that occurred could prevent seed formation for about two years. The species of tussock moth has not been determined.

Sawflies.--Five sawfly infestations were present in Region 4 this year: one in lodgepole pine, another in pinyon pine, and three in Douglas-fir. At least three species of sawflies are involved in these infestations. Within lodgepole pine stands the species is probably Neodiprion burkei (Midd.); on larch a Pristiphora n. sp.; while on Douglas-fir the sawfly falls in the Neodiprion abietis complex. The sawfly on pinyon pine has not as yet been identified.

The lodgepole-larch infestation was first observed in 1958 around Cascade Reservoir in Idaho and at the time larval populations were quite low. In 1959 these populations, particularly on lodgepole pine, had increased to such numbers that practically all old-growth needles were stripped from the trees on about 5,000 acres. Based on pupal samples per square foot of duff, the lodgepole pine sawfly increased over 8 times from 1958 to 1959. However, rearings of 1959 pupae produced only 50 percent emergence Approximately 12 percent of the larvae failed to pupate due to a virus. Consequently, a reduction in numbers is possible in 1960.

A sawfly infestation on Douglas-fir was discovered in 1956 within the Craters of The Moon National Monument in Idaho. The following year this infestation subsided but additional low level infestations were discovered. Throughout the South Fork of the Boise River and in Warm Springs Creek drainages on the Sawtooth National Forest and within Douglas-fir stands on private, State, and BLM land in Owyhee County. These infestations have remained at an endemic level with the exception of approximately 300 acres that were heavily defoliated within Deer Creek adjacent to drainages on the Sawtooth National Forest.

In May of 1959 a sawfly infestation was reported on Bureau of Land Management lands north of Pioche, Nevada on pinyon pine. Examination revealed that approximately 75 square miles of pinyon pine are currently infested. The outbreak apparently started in the vicinity of Hulse Canyon and 90 percent of the pinyon pine in this immediate area is dead. In the remainder of the infested area defoliation ranged from 10 percent in the larger trees to 100 percent in smaller trees. Duff sampling revealed a population averaging 6.14 pupae per square foot. While some evidence of natural control factors was revealed by examination of the pupae it does not appear that these factors are sufficient to reduce next year's population greatly. The species is rather important in this area because pinyon pine has become a very important Christmas tree species. Obviously none can be cut in this area.

SUCKING INSECTS

Mealybug.--An infestation of mealybugs in true firs was reported in 1958 north of Hazard Lake, on the Payette National Forest. Evidence indicated that a large population had been feeding throughout the growing season. Affected trees were alpine fir, lodgepole pine, Engelmann spruce, and white bark pine. Deposits of a black sooty mold were characteristic throughout the infested area, but underneath this mold the needles were alive and green but showed scattered feeding injury. Occasional twig killing was noted but the damage was assessed as light. In 1959 the infestation at Hazard Lake had dropped out completely but some 5 to 10 air miles west around Elk Lake a similar but less intense outbreak was discovered.

Spruce mealybug.-- Puto sp. infesting Engelmann spruce stands in southern Utah is still very active. The infestation covers about 60,000 acres in three separate locations: Thousand Lake Mountain, near Loa, Utah on the Fishlake National Forest; Griffin Springs on the Acquarius Plateau; and Barney Top on the Dixie National Forest. There is considerable tree deformity, limb killing, and reduced vigor in areas where the pest has been active for several years. In the older infestation on Thousand Lake Mountain some mortality to reproduction is occurring. The infestations continue at epidemic levels.